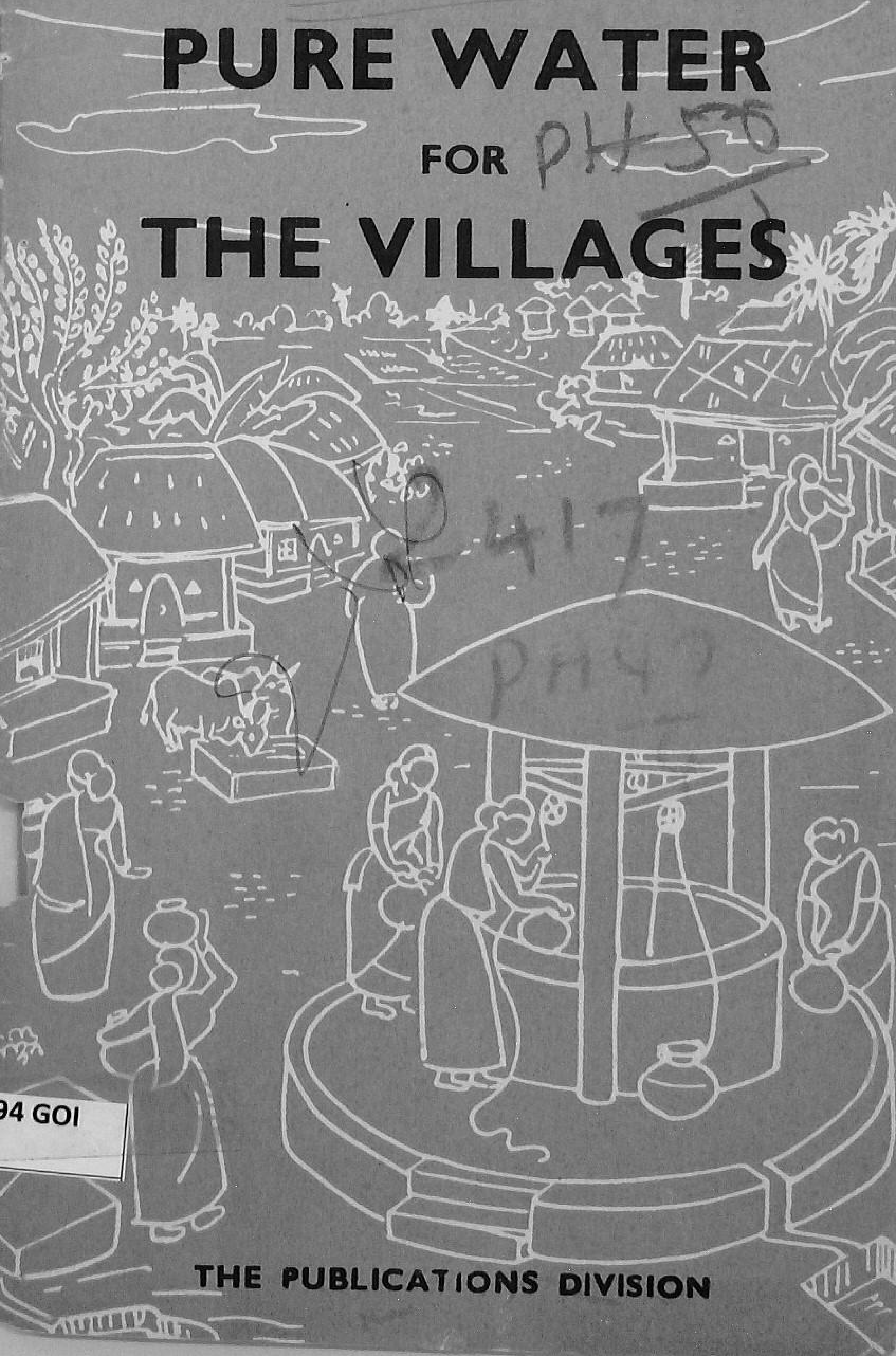
PURE WATER FOR THE VILLAGES



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I. DISEASE IN OUR WATER

Water is something very precious to us, as necessary for living as the air we breathe and the food we eat. Yes, water means LIFE. But Man, unthinking, foolish Man, has not taken proper care of this heavenly gift; unseen, unnoticed, disease has crept into our water supplies, bringing DEATH in its wake.

It was not always so. Long years ago, our forefathers found clear, sparkling water of good quality in the lakes and streams. As, however, the population increased and the uses to which water was put became more numerous, people were forced to seek out hidden springs. As time went on it became increasingly hard to find new sources of water in the densely populated areas of the world. So men had to search for water underground.

At this stage, wherever people lived together in communities—villages, towns and cities—the local water supply was used by everyone for bathing and for washing clothes, utensils, etc., besides providing drinking water for man and beast. In this way, the water became contaminated. Eventually, people became aware that water could carry sickness and even death. Thinking men realized that they could not always hope to find new sources of pure water. But how could they continue to drink water which brought disease? There was only one solution : they must protect their drinking water supplies.

The sensible way of doing this was to set apart certain ponds or wells solely for drinking water and to keep the surroundings clean. As a further protection, the water could be strained and boiled before drinking. These common-

sense precautions, as we shall see later, were in use in India 4,000 years ago!

From those distant days to the 19th century A.D. is a far cry, but in all this long period water protection measures were not improved to any great extent. Then came the Industrial Revolution in Europe and America. Huge cities sprang up, and drinking water became a serious problem. What made it worse was that the rivers and streams began to be polluted with the waste matter of the factories. So scientists put their minds to the problem and devised methods of purifying water, making it safe for drinking. All the big population centres in the industrially advanced countries now have water treatment plants. In our country, too, the cities and big towns have protected water supplies.

Unfortunately, this is not usually the case with our smaller towns. As for our villages, water protection is virtually unknown. This is what the Environmental Hygiene Committee, set up in 1948, had to say about our rural water supply :

> "Water supply is most unsatisfactory in the villages. It is the most crying need. The supply is derived mostly from wells, and sometimes from rivers, tanks and canals. The wells dry up in summer in many places. Sometimes the water is saline. The wells are badly built and the water is nearly always contaminated. Nearly a quarter of the working hours of the housewife is spent in finding and bringing drinking water. Rivers, tanks and canals are constantly polluted. The effect is that, among the causes of sickness, diarrhoeas and dysenteries rank next in importance only to malaria.............We consider that, just as crops wither for want of water, the villagers also wither for want of safe and ample water supplies."

Mind you, more than 80% of our people live in the countryside. Can we, with our dream of a Welfare State, allow millions of our countrymen to die before their time

without lifting a finger to save them? Of course we cannot. We must take active steps to free water from the disease germs that bring death.

Before we can do this we must know the nature of our enemy. Let us therefore see what these diseases are which are carried by water.

II. KNOW THE ENEMY

Not all water is fit for drinking in its original state. Some sources are heavily saline. Others contain vegetable matter; or there may be other impurities. Then again, there may be something in the water that indirectly passes disease on to Man. In all these, the water itself is at fault. However, there is another cause of water being unfit for drinking. This is when it becomes contaminated with disease germs.

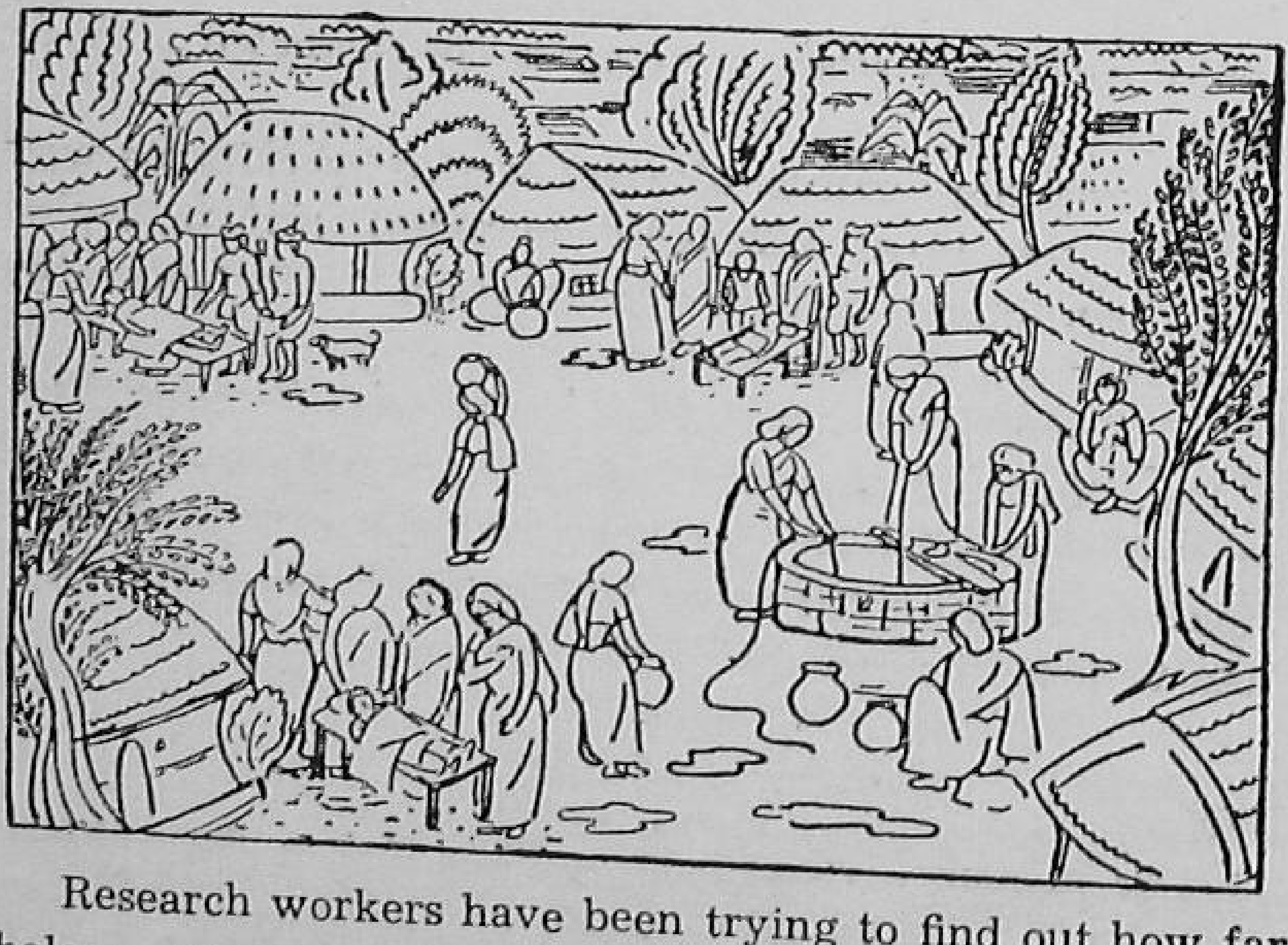
Among the common diseases carried by drinking water we find the great killers of mankind—cholera, typhoid and dysentery—besides troublesome infections like diarrhoea and the worm disorders.

We now know a great deal about these diseases, thanks to the efforts of wise men of past generations who have studied them and handed down their observations to us. This knowledge helps us in deciding what steps we should take to protect our health.

Cholera

For instance, it has been noticed that cholera appears in epidemic form in a community every fifth or sixth year. This cycle, as we call it, is becoming less marked in India because of inoculation and other measures taken to prevent the disease. These anti-cholera measures are necessary, and we have to be careful to continue them if we are to root out the disease.

Commonsense tells us that when a cholera outbreak occurs in a village, the first thing to do is to trace the source of infection. What we do is this. On a large-scale map of the village we mark the location of the houses where the first cases have been reported. We also note the water supply sources of the families concerned. It will invariably be found that the disease has broken out in one section of the village and that the victims have been drinking from a particular well or pond. This offending source of supply can immediately be sealed off and in this way the disease prevented from spreading. It may be, however, that this is the villagers' only source of drinking water. What then can we do? In such a case the answer is to sterilize the water in the manner we shall describe in a later chapter. Boiling the drinking water is a simple additional precaution that can easily be carried out by every housewife.



Research workers have been trying to find out how far cholera germs can travel down an infected river. There is proof that infection has taken place 25 miles downstream from a contaminated source. It has also been proved that cholera germs can not only live but multiply in water and preserve their vitality for several months!

Typhoid

This disease (or rather, group of fevers) is caused by the contamination of food or water by germs living in faecal matter. Typhoid is a disease of man: animals do not suffer from it. Flies and other carriers contaminating milk and food can pass on the disease, but it appears in epidemic form only when drinking water is infected. It stands to reason, therefore, that to avoid typhoid epidemics we must make a special effort to keep the germs out of our water supply.

That this is no easy task is clear when we learn that one person out of every ten in India excretes typhoid germs regularly. This means in effect that all sewage is infected, and when sewage is deposited in a river or stream that, too, carries the deadly germs. An outbreak of the disease may also occur through people urinating on ground which rain-water drains on its way to the local pond.

With typhoid germs so easily spread, how is it possible to protect our drinking water from infection ? Fortunately the position is not as bad as it seems, for these germs can be killed without much difficulty. In a dry state they die in a matter of hours. In water they live only a few days, probably a week at the most. Heat is their chief enemy. In cold weather they can stay alive in faeces for months, provided the latter remain moist; sunlight and heat, however, kill them quickly. So, a simple precaution, as in the case of cholera and other water-borne diseases, is to boil the water before drinking.

In the big towns, with their filters and water treatment plants, it is much easier to check a typhoid epidemic than in the rural areas. Here the problem, as we have seen, is an individual one for each family. Efforts to keep the surroundings of each source of drinking water clean will, however, go a long way towards preventing an outbreak of the disease in the village.

Dysentery

Dysentery is of two main types, bacillary and amoebic.

Like typhoid, the dysentery germs are found in the faeces and enter the human body through infected drinking water. Bacillary dysentery germs cannot live long in water and any outbreak that occurs is usually violent but of short duration.

Amoebic dysentery is quite another matter, and is doubly dangerous when it takes the form of cysts. The germs of this disease are very strong and remain alive for long periods even in a dry state. The only way to keep them out is by filtering the water and then chlorinating it, or simply by boiling. At present we cannot afford expensive filters in our villages, or even chlorination, so we must take extra care to prevent this dangerous enemy from entering our water supplies.

There are other water-borne diseases, such as diarrhoea, which are not in themselves fatal to adults but are all the same very troublesome. Then there are the worm disorders. It is said that in India the farmer spends half his time producing food to feed the worms inside him !

In some areas roundworm is very widespread. The roundworm ova (eggs) are present in the faeces of infected persons, and rainwater carries them to open ponds and streams. Another disease of the same family, guinea-worm, is common in areas where there is a sudden scarcity of water. It is spread by people suffering from the disease washing their sores in the public water supply. Because of this habit, step wells are invariably contaminated, besides open tanks and ponds.

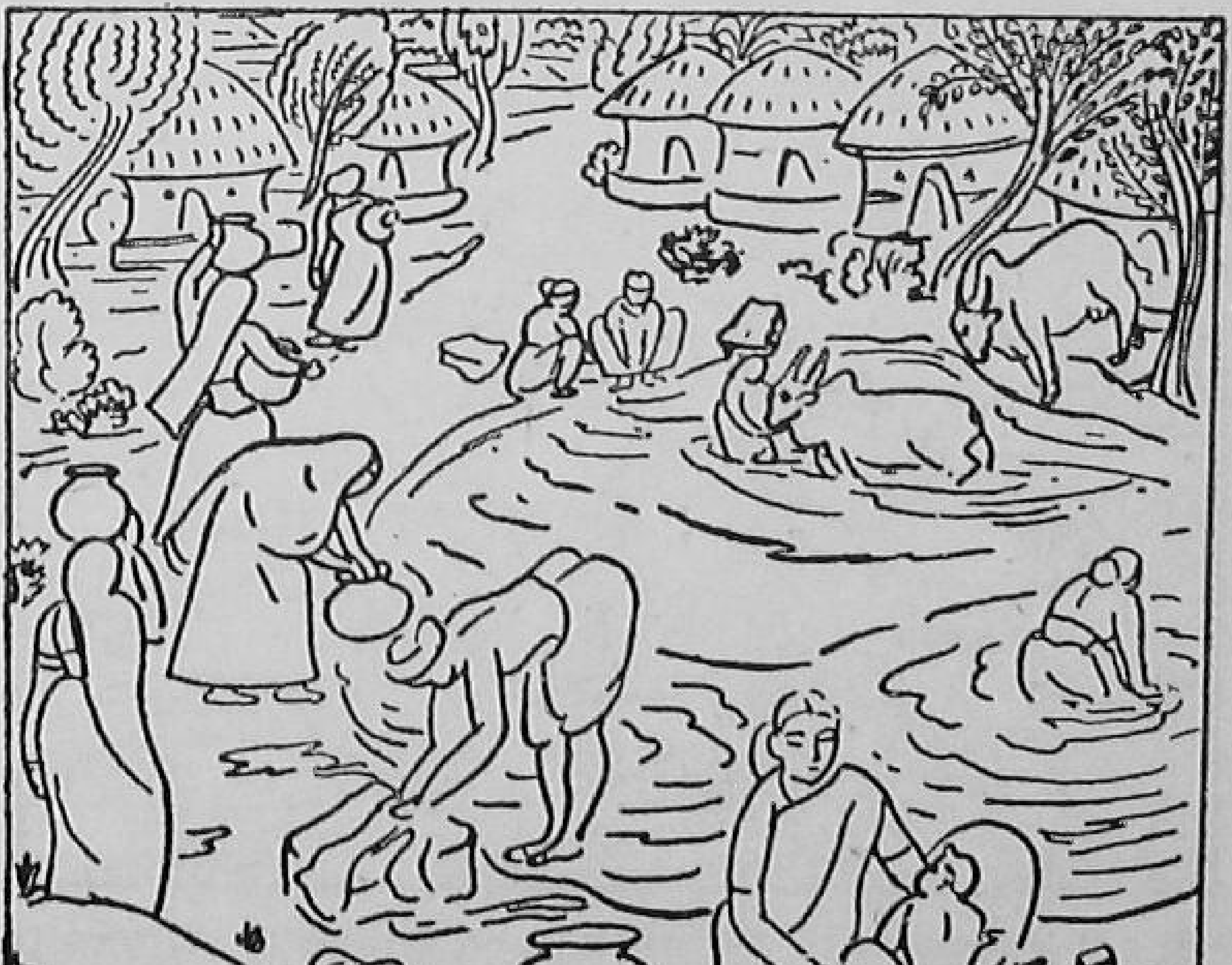
III. KEEPING OUT THE ENEMY

We now have a fair idea of the nature of the enemy that lies hidden in our water supply, spreading sickness and even death. But he has not been there all the time how then has he got in ?

A study of epidemics in India over the past fifty years shows that they have often been preceded by a failure of the monsoon, which causes people to make use of sources of water which they would normally leave alone. It is, however, the rains themselves that lead to widespread contamination as the water drains off the land into the rivers, streams and pools, carrying germs with it from infected soil. Rainwater, however, is not solely to blame. For instance, only in some cases does it drain into our wells. How have these become infected and the enemy been able to penetrate our defences!

To find the cause we have not far to seek. It lies within us. It is we, with our careless, unhygienic habits, who have contaminated our water. Man is the fool that poisons himself!

Let us take a look at our rivers, tanks and ponds—our surface water supplies. There is scarcely a tank or pond in rural India where the water is reasonably free from infection. This is because this small piece of water serves



every conceivable purpose. People bathe, and dirty, contaminated clothes and utensils are washed in the same water with which the drinking vessels are filled. These, however, are the mildest of the offences committed. What shall we say of the practice of allowing cattle to wallow in the pond? Or of children excreting nearby ? Or of farmers washing vegetables here which may have been grown in infected soil? And finally there is the rainwater, bringing to this one place the infections and impurities that a community life has left in the surrounding countryside.

Yes, everything comes into the village pond and nothing leaves—except disease germs, grateful for a new home in the human body. Then the water gives birth to a new and dreaded enemy—malaria—and so the deadly process goes on.

It's the same with our rivers and streams. Where these pass by our villages they are contaminated in the same manner as our tanks and ponds. Where they lie near towns

they are used for the disposal of sullage and the waste matter of industrial plants. River water is also polluted by dead bodies. This pollution by the bodies of persons who have died from cholera, smallpox and other infectious diseases is known to have been responsible for severe epidemics in villages, towns and cities far downstream.

Even our underground supplies of water have not escaped contamination. Again the old story of people bathing and washing germ-laden clothes and utensils near the wells, so that some of the dirty water splashes in, is repeated. Sometimes the well is built in such a manner that water drains towards it from higher ground and there is no protective parapet. Infection may also enter through dust or the use of dirty buckets and ropes.

If there is an insanitary latrine near the well there is a likelihood of disease germs making their way into the water by percolation. A *kuchcha* well is very easily contaminated in this manner.

These, then, are some of the ways in which disease can enter our drinking water. How can we keep it out? This is not really as difficult as it seems when we remember that most of the trouble is of our own making. So we can go a long way towards controlling disease by observing the simple rules of hygiene.

For instance, in regard to ponds and tanks which supply drinking water, we should take the following precautions:

(1) The tank should be sunk in good soil amid clean surroundings.

(2) No sullage or surface drain should enter it. It is very important that people should not excrete nearby, else rainwater will carry germs into the tank.

(3) Cattle and domestic animals should be kept out by a fence.

(4) Bathing, and washing of clothes and utensils in or near the water should be stopped.

In some places percolation wells have been sunk near a pond or tank. Water percolating into these wells can conveniently be disinfected and made safe for drinking.

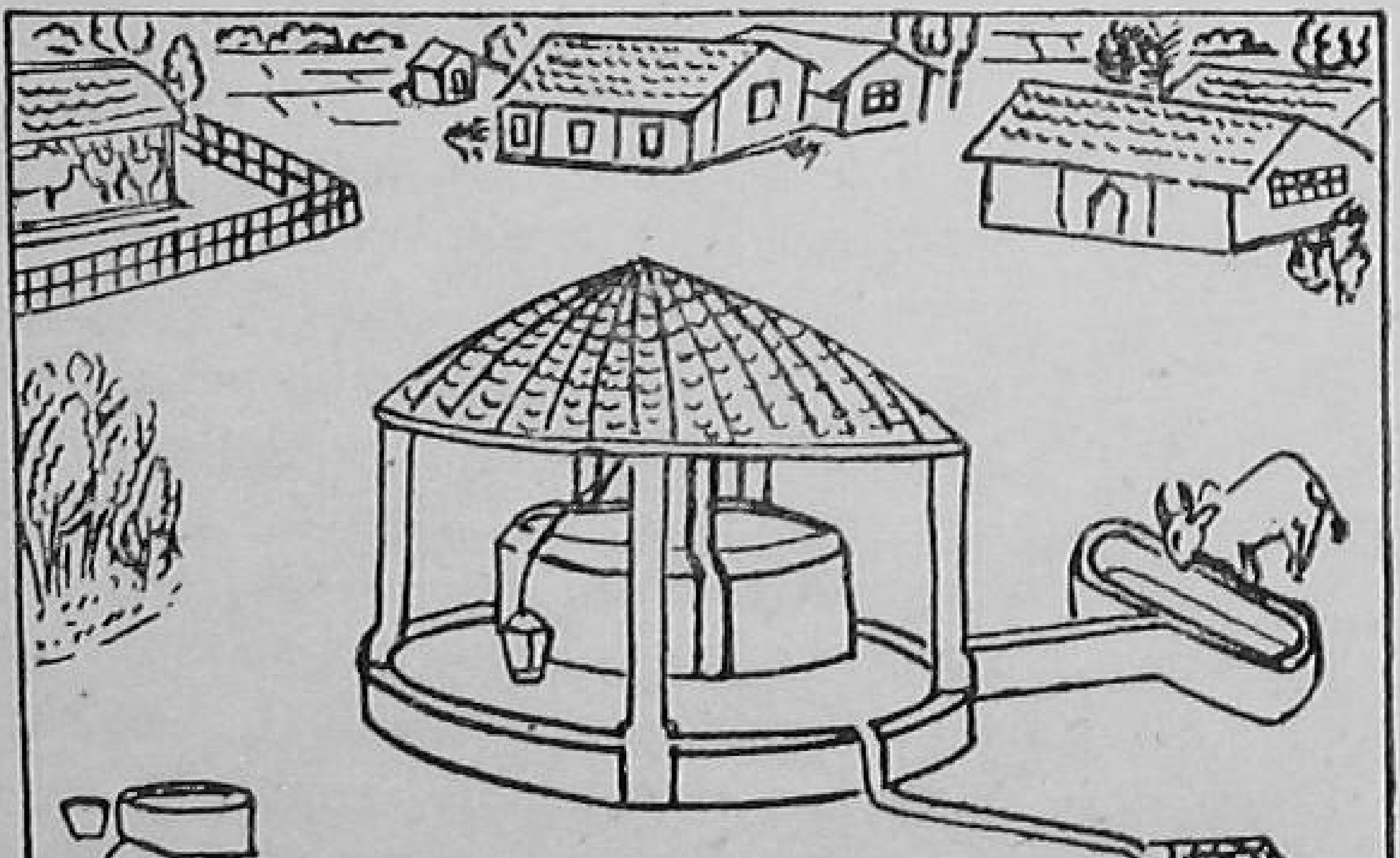
So much for our surface water. What of our underground supplies? How can we keep our well water clean and pure? Here, too, there are certain simple precautions which we can easily take. These are:

(1) The well should be located on high ground some distance from the village homes.

(2) It should be a *pucca* structure. Paving will do, provided the gaps between the stones are tightly packed with mortar to prevent percolation from the surrounding area. Every village should, however, have one or two drinking water wells lined with cement concrete.

(3) There should be a cement or stone parapet about three feet in height to prevent surface water entering the well.

(4) From the well there should be a cemented plat-



form about six feet in width sloping down to the ground. The platform should end in a shallow

channel leading to a drain which will carry off the water spilled during drawing to a soakage pit or a nearby field.

(5) The well should be provided with a cover to keep out leaves and dust and, to help in cleaning, climbing hooks should be fixed down the sides during construction. The cover will also prevent mosquitoes breeding inside.

(6) No latrine, cattle shed, manure pit or open drain should be permitted within 100 yards of the well. This will lessen the chance of disease germs entering the water through percolation even where the well is not lined with concrete.

(7) Bathing and washing of clothes, utensils, etc., should not be permitted nearby.

These measures would undoubtedly go a long way towards keeping infection out of our drinking water. They do, however, require some effort on our part to ensure their success. For instance, we can build a well in a way that will satisfy the most critical public health expert, but if we continue to bathe and wash clothes on the parapet or allow the surroundings to be dirty the water will still be contaminated.

It is therefore very important that our village folk should be taught the need for cleanliness. They must be clear in their own minds that soil pollution and insanitary habits are the causes of sickness and disease. For this, teaching to have full effect it must be started in the primary school-room, for if the children of today learn sanitary habits they as citizens of tomorrow will continue these habits.

Adults, however, must also understand the importance of hygienic habits. In the Community Project areas these ideas are being propagated. An important means of preventing the contamination of drinking water is the use of sanitary latrines, as the pollution of soil by excreta is one of our main difficulties in the fight against disease.

The effort to make people health-minded must go on.

Unless the villagers can be brought to the stage where they *want* pure water, they will not co-operate in making our plans a success. It is here that the panchayats can be most useful, for they are composed of leaders of the people whose word is listened to with respect. They are best suited to the task of mobilizing public opinion behind the movement to keep the enemy out of our water supply.

IV. A FINAL PRECAUTION

In striving to prevent disease germs from entering our water we know that we cannot hope for 100% success. No matter how great our efforts, some germs will find a way in. Our tanks and ponds, for instance, are open to the sky and germs can enter by means of dust blown by strong winds. Even our wells cannot be absolutely safe. So we must take extra care to kill germs that may have accidentally found their way into our water. In other words, to make certain that the water is safe for drinking we must purify it.

In India, the purification of water is no new thing. Indians, along with the Chinese, were pioneers in this field thousands of years ago. The Sushruta Sanhita says: "It is good to keep water in copper vessels, expose it to sunlight and filter it through charcoal." Another ancient medical book gives this advice: "Foul water should be treated by boiling and exposing it to sunlight, by dipping seven times into it a piece of hot copper, then by filtration through coarse sand and gravel and finally cooling it in earthenware vessels."

Today there are three recognized methods of purifying water—boiling, the use of chemical disinfectants and filtration plus chlorination.

Boiling is the cheapest and most simple method and can conveniently be carried out in every village home. Fifteen to twenty minutes' boiling will kill germs. After

boiling the water should be put in a container and allowed to cool before drinking. It is good to store water in the sunlight, as our ancient books say, but this must be done in such a manner that dust, leaves, etc., do not fall in and contaminate the supply once more.

Coming to our second method, the most common chemical used in disinfecting water is bleaching powder. It is very suitable for use in village wells. About 1 oz. of powder is sufficient for a single well. The powder is dissolved in a bucket of water, which is lowered into the

well. The water is then thoroughly stirred, and in about an hour it is safe for drinking. It must be remembered that this method will not be of much use if the well water is muddy or dirty.

Another chemical used as a disinfectant is potassium permanganate. This chemical kills the small live substances which provide food for the disease germs, and thus indirectly kills the germs. As in the case of bleaching powder, a handful of potassium permanganate crystals is dissolved in

a bucket of water and lowered into the well. This procedure should be carried out late in the evening, as it takes four to six hours for the chemical to have effect. Potassium permanganate gives the water a slightly pink colour. This does no harm.

The two means of water purification that we have just discussed are suitable for our villages. There is a third method—filtration—which is normally used in our towns and cities, where water purification has to be done on a large scale before the supply is made available to the public through pipes. There are two common types of filters—slow sand and mechanical filters—but we need not discuss them in a pamphlet which deals only with our present-day rural water supply. It is interesting to note, however, that even after filtration the water must be treated with chlorine to make it absolutely safe for drinking.

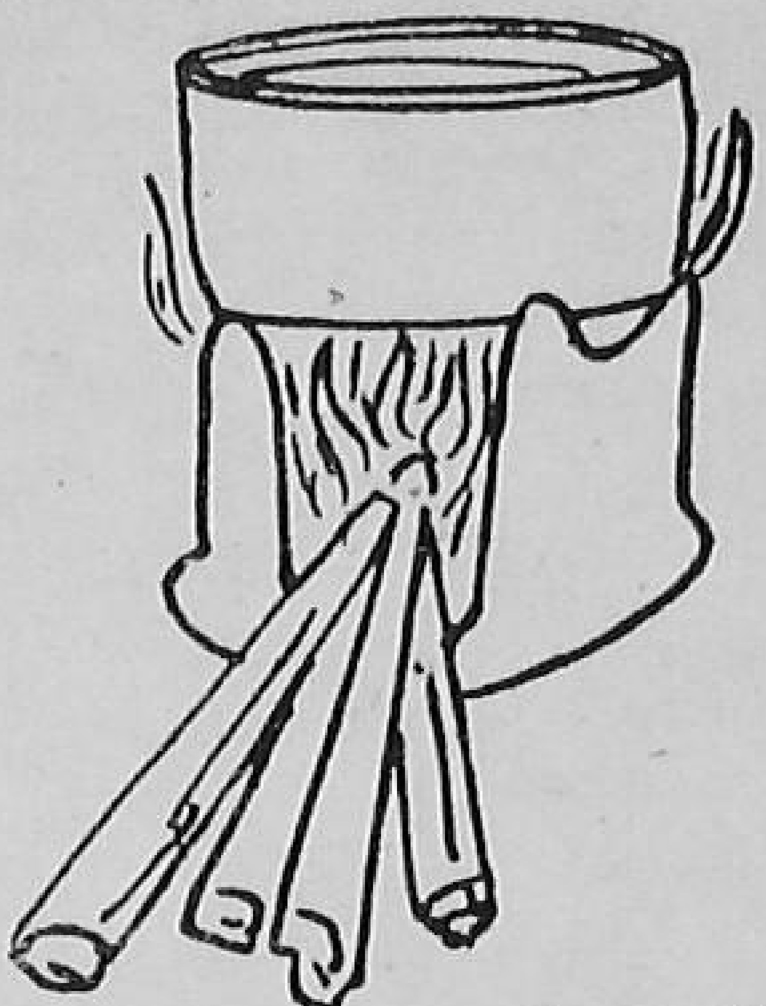
V. CONCLUSION

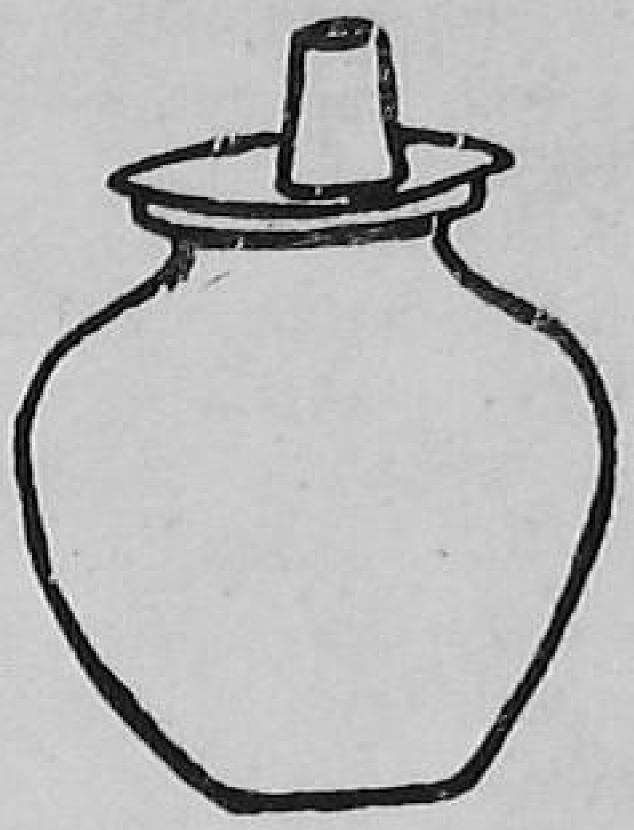
When we have talked of the various steps we must take in order to keep disease out of our water, one question inevitably comes to mind: is it worth while to take all these precautions, many of which involve a change in our habits? Surely, the water that was good enough for our fathers is good enough for us?

There is this very good reason why we should take the trouble. On an average, two million Indians die every year and fifty million are rendered chronically ill through water-borne diseases! Staggering figures, are they not? And, apart from the suffering and death, perhaps what is more important is that there is tremendous economic loss to the country through absence from work and the cost of medical care of the victims.

Because of this, our Five Year Plan attaches great importance to the improvement of water supply in its Health

programme. We are coming to grips with the problem, but it is no easy task. In 1949, the Environmental Hygiene Committee reported that just over 6% of the total population of the country had protected water supplies. This figure included the urban areas. In the villages, practically





nothing had been done. This was the position when the Plan came into existence. How are we tackling this vast problem of providing safe water to the people of five and a half lakh villages?

Well, for one thing we have sunk numbers of tubewells in certain selected areas. Some villages near the big towns are even getting piped water, and electric pumps have been supplied in areas where power is available. In other places, diesel pumps have been installed. In such cases, the pump carries water to an overhead tank and pipes lead from thence to community taps. Every well fitted with a pump has a small window from which water can be drawn if the machine goes out of order. The window also provides a means of entry into the well for cleaning purposes and disinfection.

Generally speaking, however, we have only been able to touch the fringe of the problem so far. Until we can afford public health engineering services on a large scale we will have to do the best we can to provide good drinking water within the resources of each village itself.

This means in effect that we have to devise common-sense, practical methods of protecting our water supply at little or no cost. We have discussed some of these methods in this little pamphlet. No doubt, these methods are not perfect; but in areas where expensive water treatment plants are unheard of, and even a piped supply is only a dream, they do provide a rough and ready means of keeping DEATH out of our drinking water.

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